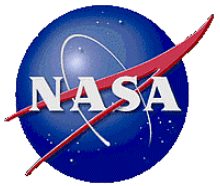


IV&V Workshop 2010:

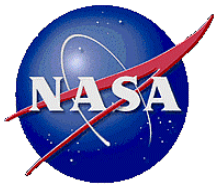
IV&V MADE Testbed Requirements and Configurations

David Soto

September 17, 2010

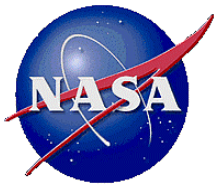
L-3 Communications

Agenda



- **IV&V Testbed Requirements**
- **ISS Space Station**
  - Description of 1553 Architecture (3-tier system)
- **MADE Testbed Environment**
  - Description of MADE system
- **IV&V Testbed Configurations**

IV&V Testbed Requirements

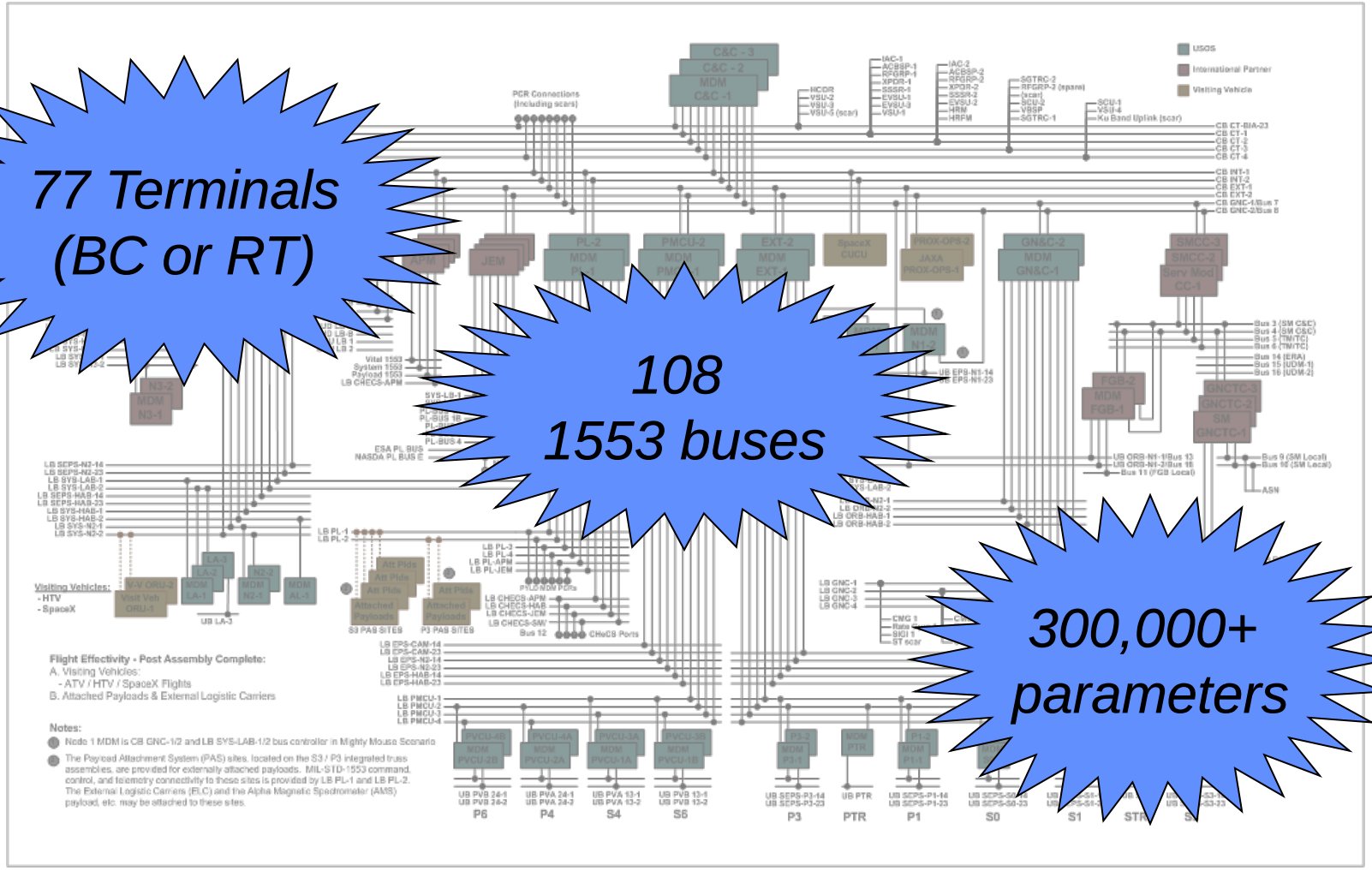


- **Simulate single-CSCI and multi-CSCI configurations**
- **Simulate the CSCIs that are in-scope for IV&V**
- **Provide test script development and execution**
- **Compatible with ISS developer's test environments**
- **Run on standard PC computers (Windows)**
  - Remote connection for remote users

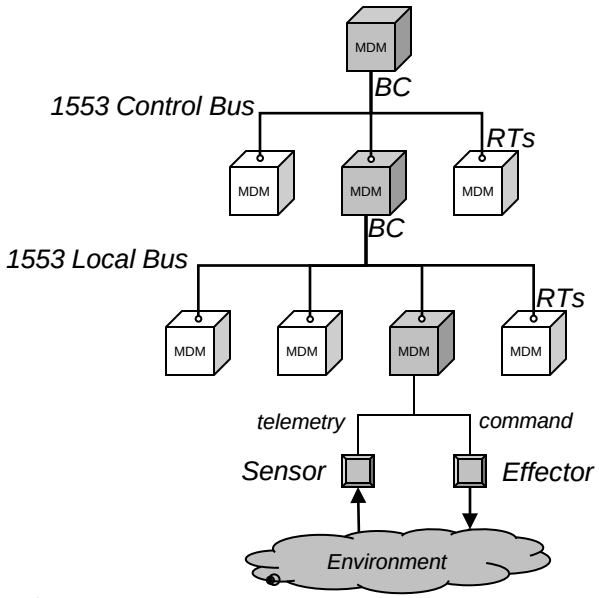
An ISS CSCI (computer software configuration item) is simply an ISS flight software program that is loaded in one of the ISS flight computers.

NASA
IV&V
Facility

ISS 1553 Architecture
(Complex)



Simplistic View of ISS System Hierarchy



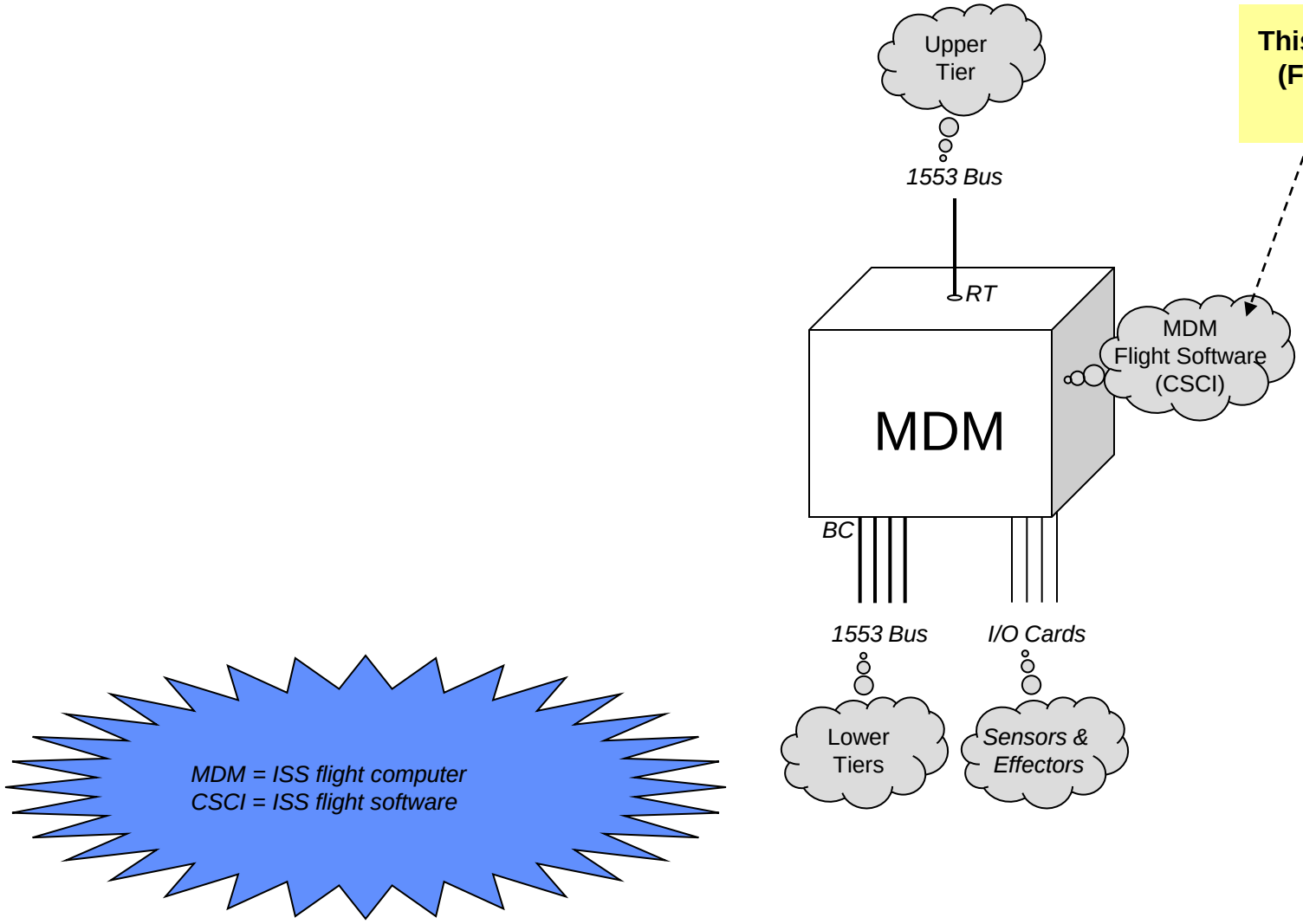
Tier 1

Tier 2

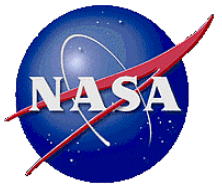
Tier 3

An MDM (multiplexer de-multiplexer) is an ISS flight computer.

Generic MDM Configuration



MATE versus MADE



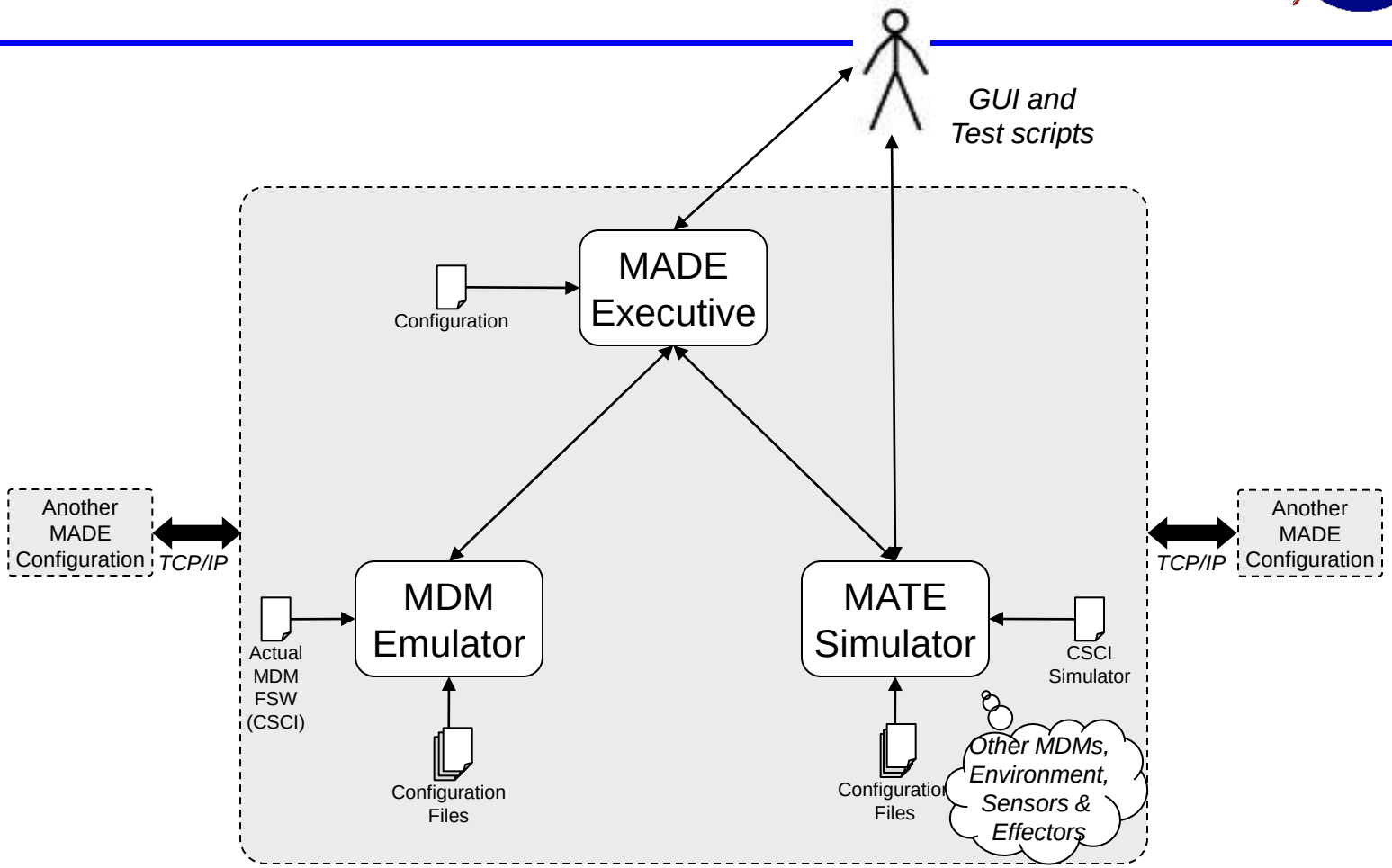
- **MATE (MDM Application Test Environment)**
  - Uses flight-equivalent MDM and 1553 hardware
  - Runs actual MDM FSW
  - ISS environment, sensors, and effectors simulated
  - Executes C-scripts (test scripts)
  - Real-time and concurrent

Formal test environment used by the developer

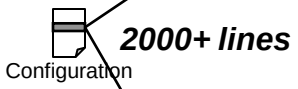
- **MADE (MDM Application Development Environment)**
  - Runs on PC's (Windows)
  - Runs actual MDM FSW (small mods to startup code)
  - 1553 buses emulated using TCP/IP
  - Reuses MATE simulators and configuration data (ISS environment, sensors, effectors, etc.)
  - Executes C-scripts (test scripts)
  - Not real-time, sequential

Informal test environment used by developer and IV&V

Generic MADE Configuration



MADE Configuration File



2000+ lines

```
-- LAB_T3_SIM_RTIOP_1 Simulation Server Definition
--
START_SIM      LAB_T3_SIM_RTIOP_1
   PATH        Z:\SVF_MADE_CCU\cscript
   TYPE        MATE
   HOST        191.199.27.115
   COMMAND     MATE_Executive.exe
   START_PARAMS
      DESCRIPTION Scenario file name
      TYPE        FILENAME
      VALUE       ..\Simulations\RTIOP_1_TCE_X2_S0R3\made_flt_AC_r3v16_svf_m4.scn
      DESCRIPTION Simulator Wrapper
      TYPE        FILENAME
      VALUE       voss_c_crtmain_IA.bat
   END_PARAMS
END_SIM
-- Airlock MDM Definition
--
START_SIM      Airlock
   PATH        Z:\SVF_MADE_CCU\Flight_Software\Airlock
   TYPE        MDM
   HOST        191.199.27.108
   COMMAND     layer_1.exe
   START_PARAMS
      DESCRIPTION MDM Simulator Config File
      TYPE        FILENAME
      VALUE       ALSYSR3V20_20A_REVA_AL1.mdm
   END_PARAMS
END_SIM
```

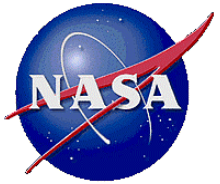
Host computer to run simulation specified by IP address

MDM FSW file to load is specified

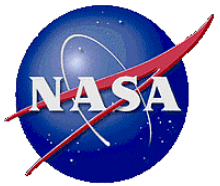
Bus connections between simulations are specified

```
--Bus Type        Bus Name
1553_BUS          LB_SYS-HAB-2
--   Sim Name     Connector
   INT_SIM_RTIOP_3      7
   INT1                 5 2
   INT2                 5 2
   Airlock              BIA
END_BUS
--
--Bus Type     Bus Name
1553_BUS      UB_LA_3
--   Sim Name     Connector
   LAB_T3_SIM_RTIOP_1    0
   LSYS3                 0 1
END_BUS
```

IV&V Testbed Configurations



- **Vertical**
  - Single-MDM configuration (FQT configurations)
    - « Acquired after a CSCI release (post-FQT)
    - « Acquired from CSCI developer
  - Loaded onto single-desktop
  - Meets IV&V's need to independently test CSCI releases
  - Primarily tested using test scripts developed by IV&V
  - Small foot-print to run and execute (one computer)
- **Horizontal**
  - Multi-MDM configuration that simulates complete ISS system
    - « Acquired after a Stage release (post-integration)
    - « Acquired from the Stage integrators (developer)
  - Loaded into IV&V testbed computers (lab)
  - Meets IV&V's needs to independently test HSI (Stage) releases
  - Primarily tested using PCS and MADE graphical user interfaces (GUI)
  - Large foot-print to run and execute (13 computers)
- **Diagonal**
  - Multi-MDM configuration developed by IV&V from FQT single-MDM configurations
  - Meets IV&V's need to test multi-MDM configuration with latest CSCI releases (prior to HSI release)
  - Can be loaded and run in the IV&V testbed lab or single-desktop
  - Primarily tested using test scripts developed by IV&V
  - Medium foot-print to run and execute (one to many computers)



Diagonal
Testbed
Demonstration

Next